



**QUEEN'S
UNIVERSITY
BELFAST**

Becoming kinder: Prosocial choice and the development of interpersonal regret

Uprichard, B., & McCormack, T. (2018). Becoming kinder: Prosocial choice and the development of interpersonal regret. *Child Development*, 90(4), 1-19. <https://doi.org/10.1111/cdev.13029>

Published in:
Child Development

Document Version:
Peer reviewed version

Queen's University Belfast - Research Portal:
[Link to publication record in Queen's University Belfast Research Portal](#)

Publisher rights

© 2017 The Society for Research in Child Development, Inc.

This work is made available online in accordance with the publisher's policies. Please refer to any applicable terms of use of the publisher.

General rights

Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact openaccess@qub.ac.uk.

Becoming Kinder: Prosocial Choice and the Development of Interpersonal Regret

Brian Uprichard & Teresa McCormack

Queen's University Belfast

To appear in *Child Development*

Accepted October 2017

Abstract

Three experiments examined children's ability to feel regret following a failure to act prosocially. In Experiment 1, 90 6-to 7-year-olds and 107 7-to 9-year-olds were given a choice to donate a resource to another child. If they failed to donate, they discovered that this meant the other child could not win a prize. Children in both age groups then showed evidence of experiencing regret, although not in control conditions where they had not made the choice themselves or their choice did not negatively affect the other child. In Experiment 2, 85 5-to 6-year-olds and 109 7-to 9-year-olds completed the same task; only the older group showed evidence of regret. In Experiment 3, with 134 6-to 7-year-olds, experiencing regret was associated with subsequently making other prosocial choices.

There has been a surge of research on the development of regret in children over the last five years (Burns, Riggs & Beck, 2012; O'Connor, McCormack & Feeney, 2012, 2014; O'Connor, McCormack, Beck & Feeney, 2015; Rafetseder & Perner, 2012; Van Duijvenvoorde, Huizenga, & Jansen, 2014; Weisberg & Beck, 2010, 2012). All of this research, and indeed most research on regret in adults, has focused on regret in the context of self-interested choice. However, regret may also occur in the context of decisions that have a negative impact on another person rather than on oneself (Berndsen, van der Pligt, Doosjie, & Manstead, 2004; Zeelenberg & Breugelmans, 2008). In this study, we were particularly interested in regret that occurs after a failure to act prosocially. Our aim was to examine the development of regret in the context of prosocial choice, and to determine if this type of regret develops at a similar age to regret concerning self-interested choices. We also examined whether experiencing this type of regret had an impact on children's tendency to behave prosocially.

What is regret?

Regret is usually defined as a counterfactual emotion that manifests as a negative feeling when, having made a decision, one finds out that the resulting outcome is not as good as it could have been (Van Dijk & Zeelenberg, 2005; Zeelenberg, 1999). We will adopt the terminology used by Berndsen et al. (2004) in distinguishing between intrapersonal and interpersonal regret, with the former resulting when outcomes are non-optimal for the self, and the latter when outcomes are harmful or non-optimal for another person. Both intrapersonal and interpersonal regret require the ability to think of an alternative world in which the events that caused them did not occur. In other words, they require a level of counterfactual thinking ability because they involve entertaining a possible world in which a better outcome would have obtained had a different choice been made (Roese, 1994; Roese & Olsen, 1995). Because of this requirement, counterfactual thinking abilities must

have developed in order for children to be able to experience such emotions. However, there is considerable debate over when counterfactual thinking skills first emerge (e.g., Beck, Robinson, Carroll, & Apperly, 2006; Harris, German, & Mills, 1996; Rafetseder, Schwitalla, & Perner, 2012). Given this, it is not surprising that there is also some disagreement over when children can first experience regret.

Although there is disagreement over when children can first experience regret, there is broad agreement that this is a relatively late developing emotion because of its reliance on counterfactual cognition. This is particularly important when considering the question of when interpersonal regret can first be observed, because it has been suggested that even very young children show some behavioral and physiological evidence of negative emotions following a transgression (Ioannou et al., 2013; Kochanska, Gross, Lin & Nichols, 2002). Developmentalists studying such emotions in young children typically described themselves as measuring guilt rather than regret. Guilt has indeed been sometimes assumed to be closely associated with counterfactual thought (e.g., Mandel, 2003; Niedenthal, Tangey, & Gavanski, 1994), and some researchers do not seem to differentiate between guilt and what we have termed interpersonal regret (Berndsen et al., 2010; Malti et al. 2016; though see Proeve & Tudor, 2010; Zeelenberg & Breugelmans, 2008). However, although there is good evidence that counterfactual thinking may indeed magnify feelings of guilt (Mandel & Dhimi, 2005; Miller & Turnbull, 1990), we do not believe that in its simplest form guilt necessarily requires counterfactual thought. That is, we are assuming that negative feelings of guilt can result from considering the harm that one has done in the actual world without necessarily requiring in addition entertaining the counterfactual thought that the harm could have been avoided if one had chosen differently. This leaves open the possibility that young children who have difficulties thinking counterfactually may potentially be able to experience guilt, with interpersonal regret being a later-developing emotion.

The Development of Regret

Typically, when measuring regret in children, a simple task is used in which children make a forced choice between two options in order to gain a reward; in most developmental studies, children choose between two boxes that contain small prizes. Children initially see what prize their chosen box contains and then rate their emotion on a self-report scale (usually depicting faces ranging from very sad to very happy). In circumstances in which regret is being measured, children are then shown that if they had chosen the other box they would have obtained a better prize and are typically asked to rate their feelings again. Children who report feeling sadder on seeing that they could have won a better prize had they chosen differently are classified as experiencing regret. This form of forced choice task has been used in the majority of studies on the development of regret in children (Burns et al., 2012; O'Connor et al., 2012, 2014; O'Connor, McCormack, Beck & Feeney, 2015; Rafetseder & Perner, 2012; Van Duijvenvoorde et al., 2014; Weisberg & Beck, 2010; 2012). Although studies differ from each other in procedural details, the majority of these studies suggest that children experience regret from around 6 years, although some researchers place this development a year earlier (Weisberg & Beck, 2012).

The notable exception to this pattern is the study of Rafetseder and Perner (2012); these researchers argue that it is not until children are around 9 years that regret is first in evidence. Rafetseder and Perner's (2012) reluctance to conclude that younger children can experience regret stems in part from their concern that children's negative feelings on discovering that they could have won a better prize may not be best described as regret. Specifically, they suggest that this negative emotion may be better described as frustration about not having the best prize (which does not necessarily require thinking counterfactually) rather than regret over not having chosen differently. Weisberg and Beck (2012) also considered this possible interpretation of children's emotions and examined it by

manipulating children's responsibility for the outcome. They compared three conditions: either children chose between two boxes to win a prize, children threw a die to determine which box they received, or the experimenter threw a die. They found that children were only likely to report feeling sadder on seeing what prize they could have obtained in the first of these conditions, and argued that this suggested that these feelings of sadness reflected regret regarding the choice for which they had responsibility (see also O'Connor et al., 2015). They reasoned that if children's emotions simply reflect frustration at not having the best outcome, they should feel sad in all three conditions.

The Development of Guilt

We are not aware of any developmental studies that have directly examined interpersonal regret per se. However, there is a considerable body of research on the development of guilt (e.g., Barrett, Zahn-Waxler, & Cole, 1993; Bybee, 1998; Ferguson, Stegge, Miller, & Olsen, 1999; Malti, 2016; Malti & Dys, 2015; Tangney, Wagner, Hill-Barlow, Marschall, & Gramzow, 1996). Behavioral studies of guilt in younger children have typically used a mishap paradigm, in which young children cause accidental damage to an object and their behavioral and affective responses to the situation are measured. These studies find that many toddlers show a response pattern that has been interpreted as guilt, such as reparative behavior combined with evidence of distress or discomfort in their facial/vocal expressions and bodily posture (Barrett et al., 1993; Kochanska et al., 2002). Children's physiological responses in the mishap paradigm are consistent with this interpretation of their behavior (Baker, Baibazarova, Ktistaki, Shelton, & Van Goozen, 2012; Iannou et al., 2013).

Although responses on the mishap task are usually interpreted in terms of guilt, it is notable that the design of the task is such that children are not faced with a decision as to whether to act in a moral or prosocial way. Rather, they accidentally damage an object

belonging to someone else. Although children's responses do seem to be predictive of certain aspects of development relevant to morality, it is not clear that the task measures the same type of emotion that we think of as guilt following a failure to make a moral or prosocial choice. Indeed, some researchers have suggested that it is better to describe this task as measuring post-transgression distress rather than assuming it measures a specific moral emotion (Kim et al., 2014).

Experimental studies of guilt in older children and adolescents have focused on moral choice, but have typically used self-report questionnaires or scenario-based tasks in which participants predict how they or someone else would feel if they had made a moral transgression or decided not to act prosocially (reviewed by Ferguson & Stegge, 1992). Many studies in this area have focused on the "happy victimizer" phenomenon (Nunner-Winkler & Sodian, 1988), whereby younger children attribute positive emotions to a moral transgressor (either themselves or a hypothetical character) who has achieved a desired outcome. There is a well-documented developmental increase during middle childhood in the likelihood that children will attribute some negative emotions to transgressors (Arsenio & Kramer, 1992; Arsenio & Lover, 1995; Keller, Lourenço, Malti, & Saalbach, 2003).

Developmental changes in children's performance on this task are widely interpreted as reflecting developmental changes in the ability to anticipate guilt (Malti, 2016; Malti & Dys, 2015; Malti, Gummerum, Keller, & Buchmann, 2009), with the emergence of this anticipatory ability assumed to have an effect on children's moral and prosocial choices (Ongley & Malti, 2014; Malti, 2016). We note that it is at least possible that this task taps into the ability to anticipate regret (with its counterfactual component) as well as guilt; establishing this would require a more fine-tuned methodology that establishes the nature of the negative emotions that children predict. However, a limitation of this line of work is that, regardless of which negative emotion it examines, the happy victimizer paradigm (along with

other scenario-based measures) does not provide a direct measure of the emotion per se: Even under circumstances in which children are asked to imagine how they would feel if they were the victimizer (Keller et al., 2003), children are anticipating hypothetical emotions rather than reporting emotional experiences that result from real choices. This is important, because developmental research on intrapersonal regret suggests that children can experience regret before they can anticipate it, and that this experience itself has a direct impact on decision making (McCormack & Feeney, 2015; O'Connor et al., 2014).

In summary, although there is a substantial literature on the development of guilt that has richly informed our understanding of the development of moral emotions and the role they may play in moral or prosocial development, it is not yet clear when children begin to experience interpersonal regret following a failure to make a moral or prosocial choice, and whether experiencing this emotion has an impact on children's prosocial behavior. The aim of the current study was to examine these issues using a task in which children faced a real choice over whether to act prosocially.

The Present Study

The present study examined whether 5- to 9-year-old children reported a negative emotion on realizing that if they had made a choice to act prosocially, they would have avoided causing harm to another person. In the first phase of our task, children completed a worksheet by filling it in with stickers in order to win a small prize. They were then asked whether they wanted to donate a spare sticker to the next participant. The vast majority of children decided not to donate the sticker. We then showed children that the next child could not win a prize because they did not have enough stickers. At this point, we asked children to report their emotions using an emotion scale. Children did not know at this stage of the task that they had chosen to keep the specific sticker that the other child needed, and their emotion responses could have reflected their reaction to discovering that the other child could not win

a prize. In the final phase of the task, children found out that if they had donated the specific sticker that they had decided to keep, the other child would have been able to win the prize. Children were then asked a second time about how they felt relative to their first emotion rating (i.e., whether they now felt happier, sadder, or the same). This second rating examined whether they then felt sadder on being given information that allowed them to infer that it was their fault that the other child was disadvantaged, and only this subsequent rating was taken as an indication of whether they felt regret.

We wanted to ensure that the emotion we measured reflected children's responsibility for the negative outcome. Inspired by Weisberg and Beck's (2012) study, we did this by distinguishing between circumstances in which children had the sticker the next child needed because they had chosen to keep the sticker (Experimental condition), and those in which in which children had the necessary sticker but had not personally chosen to keep it. To do this, we introduced a condition – the Unintentional condition - in which the sticker was assigned to children by the throw of a (loaded) die. If children's emotions reflect regret over their choice, then we would expect to see higher levels of reported negative emotions in the Experimental condition compared to the Unintentional condition.

We also used an additional Control condition, in which children made the choice as to whether to keep the sticker, but the sticker they kept turned out not to be the specific sticker that the next child needed to win a prize. This condition differed from the Experimental condition in terms of the counterfactual that would have obtained if children who decided to keep the sticker had made a different choice: that is, if children had donated their sticker in the Control condition it would not have made any difference to whether the next child could win a prize, whereas it would have made a difference in the Experimental condition. If children's responses in the Experimental condition reflected their regret regarding their

choice, then we would anticipate that more children would report feeling sadder in that condition than in the Control condition.

In summary, then, in Experiments 1 and 2, there were three conditions. The Experimental and Unintentional conditions did not differ from each other in terms of the counterfactual that would have obtained if children had not kept the sticker, but they did differ in terms of whether children were responsible for having kept the sticker. The Experimental and Control conditions both involved children being responsible for the choice as to whether to keep the sticker, but they differed from each other in the counterfactual that would have obtained if children had decided to donate the sticker. In Experiment 1, we used this paradigm with two age groups, 6- to 7-year-olds and 7- to 9-year-olds, to examine whether they showed evidence of interpersonal regret. We chose these age groups because the majority of studies of the development of intrapersonal regret suggest that children are capable of feeling regret by 6-7 years. To anticipate, because we found no age effects in Experiment 1, we ran a second experiment, the aim of which was to replicate the findings of Experiment 1 for the older group, and to examine if age effects emerged when a younger group of 5- to 6-year-olds was included. We included this younger age group because there is mixed evidence over whether children of this age experience intrapersonal regret (Amsel & Smalley, 2002; Van Duijvenvoorde et al., 2014; Weisberg & Beck, 2012).

Whereas the aim of Experiments 1 and 2 was to try to establish whether children experience interpersonal regret, and at what age, Experiment 3 had a different aim. Specifically, this experiment examined whether the experience of interpersonal regret had a subsequent effect on children's interpersonal decision making. If our paradigm is measuring a developmentally significant emotion, then we might expect the experience of this emotion to have a measurable effect on children's behavior. In line with theories of regret that emphasize that experiencing regret can lead to a subsequent switch in the types of choices one makes

(O'Connor et al., 2014; Zeelenberg & Pieters, 2007), we predicted that children who experienced regret after failing to act prosocially would change their behavior when faced with another choice over whether to act prosocially or in a self-interested manner. Establishing this would not only provide evidence that our task is measuring a functionally significant emotion, it would also provide support in a distinctive interpersonal context for the claim that regret has an impact on decision making.

Experiment 1

Method

Participants. A total of 197 children aged 6- to 9 years (99 females) participated in this study. Children were divided into two groups on the basis of their school years, with a younger group consisting of children drawn from two consecutive school years and an older group of children from the subsequent two school years. This resulted in a younger group of 6- to 7-year olds consisting of 90 children (46 female) aged 73-88 months with a mean age of 80 months. In the older group of 7- to 9-year-olds there were 107 children (55 female) aged 88-117 months with a mean age of 101 months. All participants were Caucasian except for three who were of Asian ethnic origin. Children were sampled using volunteer sampling via parental consent letters from schools that served all socio-economic groups. Children were randomly assigned to one of 3 conditions: Experimental, Unintentional and Control. Within the younger group, 28 children were in the Experimental condition, 29 were in the Unintentional condition and 33 were in the Control condition. Within the older group, 40 were in the Experimental condition, 31 in the Unintentional condition and 36 in the Control condition.

Materials. In the interpersonal regret task, the following materials were used: a single large, plain envelope containing six small, plain envelopes each holding a single sticker depicting a unique Pokemon along with a colored landscape picture depicting five unique

silhouettes each of which matched the outlines of five of the stickers. The task also required a similar set of materials that were described as those to be used by the next child. For this another colored landscape picture with five silhouettes (one of which was different to the silhouettes on the participant's sheet, the other four of which were the same) was used along with a large, plain envelope containing five small, plain envelopes each of which held a single sticker.

To obtain self-reports of emotions, a 5-point scale was used which ranged from very sad to very happy, along with a 3-pronged arrow (following O'Connor et al., 2012, 2014, and Weisberg & Beck, 2012). The 3-pronged arrow was a cardboard shape consisting of three arrowheads. The 5-point scale comprised five unnumbered faces ranging from a very happy face on the left to a very sad face on the right, with a slightly happy face located to the right of the very happy face, a slightly sad face located to the left of the very sad face and a neutral face in the middle of the other faces. In order to train children how to use this scale, a gorilla puppet, an elephant puppet, three toy strawberries, one toy orange and one toy apple were used. A loaded die with three red sides and three blue sides (always landing on blue) was used in the Unintentional condition, ostensibly to determine whether children donated or did not donate a spare sticker. Finally, a bag of small toys was used as a prize; it contained a rubber, bouncing ball, notepad and jigsaw puzzle.

Procedure. Each participant was first taught how to use the 3-pronged arrow with the 5-point scale. The experimenter initially showed children that the vertical prong of the arrow could be placed such that it pointed to one of the faces on the scale. The arrow was then pointed at each face in turn, and the experimenter described the emotion indicated by that face (ranging from "very happy" through to "very sad"). After children had understood this, the experimenter explained that the leftward prong of the arrow meant "even happier" and the rightward pointing prong meant "even sadder". Two different puppets (elephant and gorilla)

were then used to provide an example of how the scale and arrow worked. A puppet was given a piece of toy fruit and the child was told the puppet was slightly happy (with the arrow being placed on the slightly happy face) then the puppet had one fruit taken from her and children were asked how the puppet felt now and asked to show it using the scale and the 3-pronged arrow; the correct response involved saying the puppet was sadder using the rightward pointing prong of the arrow. Using the scale, children were told that another puppet was “very sad” at losing all but one of their pieces of fruit; the final piece of fruit was taken away from the puppet and the experimenter asked children whether the puppet felt happier, sadder or the same after losing all of their fruit. The correct response was for the child to point at the “even sadder” prong, which in fact pointed off the scale. A similar procedure was used to show how to report feeling “even happier”, which involved giving another puppet pieces of fruit rather than taking them away. Children had to give the correct responses in the training phase to move on to the interpersonal regret task.

Interpersonal regret task: Sticker task. The experimenter gave children a colored landscape picture depicting five silhouettes of different Pokemon characters. The experimenter then removed five small envelopes from a large envelope (in full view of the child) and gave them to the child with instructions to stick each sticker on the correct silhouette. Children were told that if they succeeded in sticking all stickers on the correct silhouettes, they would be given a prize. After children had finished matching the stickers to the silhouettes, they were given the small bag of prizes. The experimenter then feigned surprise at finding another small envelope with a sixth sticker in the large envelope. The sticker was different to the other ones that children had already seen, and did not match any of the silhouettes on their sheet. In the Unintentional condition, children were told that they would play a game to decide if they got to keep the spare sticker or not. The experimenter then produced a loaded die with three red and three blue sides and told the children that if the

die landed on blue they could keep the sticker. In fact the die was loaded to always land on blue, so children always got to keep the sticker in this condition. After receiving their sticker, children were told that another child was coming to play the game after them, and shown the large envelope containing the stickers for the "next person". The experimenter removed four envelopes from the "next person's" large envelope, feigning surprise that it contained only four rather than five envelopes. Children were also shown that the next person had to match five stickers to the blank silhouettes on a sheet, just as they had to do themselves previously. The experimenter asked children - "Are four stickers enough for the next person to win a prize?"; all children answered this question correctly.

Children were then asked by the experimenter: "How do you feel knowing that the next person can't win a prize? Can you show me using these pictures you used earlier?" Children rated their emotions on the 5-point scale using the upward prong of the 3-pronged arrow, yielding the initial emotion rating. After this rating, the experimenter showed children that the sticker the "next person" was missing was the sticker they had won from the throw of the loaded die. The experimenter checked that children understood this by asking: "Is this the sticker the next person needs to win a prize?", after showing children that the extra sticker they had kept matched one of the silhouettes on the sheet. When the experimenter was satisfied that children understood that they had the sticker the next person needed, they were asked to report their emotion using the 3-pronged arrow and the same scale. The experimenter showed children the scale, with the upward pointing arrow indicating the emotion that children had felt on finding out that the next person could not win a prize; he then asked children whether they now felt "happier", "sadder" or "the same", pointing to each prong of the arrow in turn. Children chose one prong of the 3-pronged arrow. After children had reported how they now felt the experimenter feigned surprise at finding the fifth sticker

the “next person” needed in their large envelope. This was done in order to reassure children that the next person would be able to win a prize after all.

In the Experimental condition the same procedure was followed. However, instead of rolling a loaded die to determine if children got to keep the extra sticker or had to give it to the “next person”, children were asked: "Well, you already won your prize but would you like to keep this sticker as well as your prize? Or would you rather give it to the next child who is going to play the game to help them get a prize? The next child has to play the same game as you just played. Remember, the next child will need five stickers to win a prize like you did. Do you want to give them this sticker to help them win a prize or keep it for yourself?" Children were then allowed to choose freely whether or not they wanted to keep the sticker or donate it to help the “next person”. Children were made fully aware that this choice was entirely theirs and no attempt was made to affect their choice. For children who decided to keep the sticker (the majority), the task then proceeded in an identical manner to the procedure in the Unintentional condition. For those children who donated the sticker, the outcome of the procedure differed slightly, insofar as it later became apparent that they had donated a sticker that the other child needed in order to win a prize. Children who donated the sticker nevertheless were asked to self-report their emotions just as in the Unintentional condition. The Control condition was identical to the Experimental condition, except that the sticker children had kept was not the specific sticker the next child needed to win a prize.

Results and Discussion

Of the 197 participants, 17 chose to donate their sticker in the Sticker task rather than keep it (2 from the younger group and 15 from the older group; see Supplementary Analysis for further information on these children). All donors were removed from further analysis resulting in a final sample size of 180 participants (90 female) with 60 in each condition.

We first examined the initial emotion ratings given by children on discovering that the next child did not have enough stickers to win a prize. Children's ratings were converted to numerical values, with 1 = very sad and 5 = very happy. The mean rating was 2.01 ($SD = 1.08$). A two-way ANOVA was conducted on these ratings with between subjects factors of Age Group and Condition. The main effect of Age Group was not significant, $F(1, 174) = 1.55$, $p = .21$, $\eta_p^2 = .009$, and the main effect of Condition and the interaction between Age Group and Condition were also not significant, both $F_s < 1$. Thus, children's emotions on initially discovering that the other child could not win a prize were generally negative and did not differ across conditions.

Children pointed to one prong of a 3-pronged arrow to report whether they now felt the same, happier, or sadder on discovering which sticker the next child was missing, yielding categorical data. Figure 1 shows the number of children in each age group and condition giving each type of emotional response (happier, sadder, or the same) on discovering whether the sticker that they had kept was the one needed by the next child. It can be seen from the figure that the only condition in which the majority of children reported feeling sadder was the Experimental condition. In the Control condition, in which children discovered that the sticker they had kept was not the one the next child needed, "same" was the majority response in the younger group and "happier" the most common response in the older group. There was no clear preferred response in either group in the Unintentional condition.

The important analyses concern whether the number of children who reported feeling sadder differed by condition; if the condition manipulation was successful, children should be more likely to feel sadder in the Experimental than the other two conditions. Table 1 shows the percentage of children who reported feeling sadder as a function of age group and condition. We conducted a binary logistic regression to examine the variables that predicted

the number of children who felt sadder. We included the predictors of age group, gender, condition (categorical variable, with the Experimental condition as the reference category), and children's initial emotion rating. We included initial emotion rating because, although there were no age or condition effects on these ratings, it is possible that these initial ratings could affect children's tendency to report whether they subsequently felt sadder. In the first step we entered only age group, gender and children's initial emotion rating into the model. The model at this stage was no better than the null model, $\chi^2(3) = 4.87, p > .05$. In the second step, we entered condition as a variable into the model. This model was a significant improvement over the model at step one, $\chi^2(2) = 22.89, p < .001$. In a third step, we entered the interaction between condition and age group as a variable, but this led to no significant improvement in fit, $\chi^2(2) = 0.09, p > .05$, so the interaction term was not included in the final version of the model. Table 2 shows the findings of the regression analysis for the full model. The Hosmer-Lemeshow test of goodness-of-fit indicated that the final model provided a good overall fit for the data. It can be seen from the table that only significant predictor of the number of children who felt sadder was condition, which was a significant predictor both when comparing the Experimental condition and the UnIntentional condition and when comparing the Experimental condition and the Control condition; there was no significant effect of age group, gender, or initial emotion rating.

Chi-squared analyses examined whether the number of children who felt sadder versus not sadder differed as a function of condition. These analyses showed that the difference between the Experimental and the UnIntentional conditions was significant, $\chi^2(N = 120) = 14.80, df = 1, p < .001$; similarly, the difference between the Experimental and the Control conditions was significant $\chi^2(N = 120) = 19.55, df = 1, p < .001$. The Control and Intentional conditions did not differ from each other, $\chi^2(N = 120) = 0.39, df = 1, p > .05$

In summary, in the Experimental condition in the Sticker task, around 59% of the 6- to 7-year-old children and 67% of the 7- to 9-year-old children reported feeling sadder when they discovered that the sticker that they had decided to keep was the one the next child needed to win a prize. This pattern of responses differed from that in the Unintentional condition, in which it was not children's choice to keep the sticker, and it also differed from that in the Control condition in which children found out that the sticker that they had kept was not the one the next child was missing. Thus, for both age groups, children only felt sadder when they had personally made a choice that turned out to disadvantage another person. We interpret this pattern of findings as suggesting that children in the Experimental group felt regret as a result of their choice. Our findings suggest that children can experience interpersonal regret from at least around 6 to 7 years. This finding is compatible with those of the majority of other studies of the development of regret (Burns et al., 2012; O'Connor et al., 2012, 2014; O'Connor, McCormack, Beck & Feeney, 2015; Van Duijvenvoorde et al., 2014; Weisberg & Beck, 2010; 2012), although previous studies have only examined intrapersonal regret. In our second experiment, we included a younger group of 5- to 6-year-olds to explore whether there was any evidence of interpersonal regret before 6 to 7 years; we also wanted to replicate our findings for the older age group given that this is a new task.

Experiment 2

Method

Participants. A total of 194 children aged 5 to 9 years (99 females) participated in this study. Children were divided into two groups on the basis of their school years, with a younger group consisting of children drawn from two consecutive school years and an older group of children from two older consecutive school years. This resulted in younger group consisting of 85 5- to 6-year-olds (42 female) aged 60-81 months with a mean age of 71 months and older group of children consisting of 109 7- to 9-year-olds (57 female) aged 93-

117 months with a mean age of 103 months. Children were divided into 3 conditions: Experimental, Unintentional and Control. Within the younger group, 29 children were in the Experimental condition, 27 were in the Unintentional condition and 29 were in the Control condition. Within the older group, 38 were in the Experimental condition, 33 in the Unintentional condition and 38 in the Control condition. All participants were Caucasian and children were sampled using volunteer sampling via parental consent letters from schools that served all socio-economic bands.

Materials and Procedure. These were identical to those used in Experiment 1.

Results and Discussion

Of the 194 children, 14 chose to donate their sticker rather than keep it (one from the younger group and 13 from the older group). All donors were removed from further analysis resulting in a final sample size of 180 participants (91 female) with 60 in each condition.

We first examined the initial emotion ratings given by children on discovering that the next child did not have enough stickers to win a prize by converting children's ratings to numerical values, with 1 = very sad and 5 = very happy. The mean rating was 2.10 ($SD = 1.12$). A two-way ANOVA was conducted on these ratings with between subjects factors of Age Group and Condition. The main effect of Age Group was not significant, $F < 1$. However, the main effect of Condition was significant, $F(2, 174) = 6.07$, $p = .003$, $\eta_p^2 = .065$, although the interaction between Condition and Age Group was non-significant, $F < 1$. Mean ratings were highest for the Unintentional condition, 2.47 ($SD = 1.00$), and lower for the Experimental Condition were 2.01 ($SD = 1.21$), and the Control condition, 1.77 ($SD = 1.12$). Subsequent t -tests showed that the ratings in the former condition differed from those in the other two conditions, $t(118) = -1.98$, $p = .05$, $t(118) = 3.72$, $p < .001$, but the latter two conditions did not differ.

Figure 2 shows the number of children in each age group and condition giving each type of emotional response (happier, sadder, or the same) on discovering whether the sticker that they had kept was the one needed by the next child. It can be seen from the figure that the only condition in which the majority of children reported feeling sadder was the Experimental condition, and this was only the case for the 7- to 9-year-old group.

Table 1 shows the percentage of children who felt sadder as a function of age group and condition. As in the analysis of the data from Experiment 1, we conducted a binary logistic regression to examine whether any variables predicted the number of children who felt sadder using the predictors of age group, gender, condition, and children's initial emotion rating. In the first step, we included age group, gender and children's initial emotion rating as variables into the model. The model at this stage was no better than the null model, $\chi^2(3) = 4.49, p > .05$. In the second step, we entered condition as a variable into the model. This model was a significant improvement over the model at step one, $\chi^2(2) = 13.03, p < .01$. In a third step, we entered the interaction between condition and age group as a variable, and this led to a significant improvement in fit, $\chi^2(2) = 11.77, p < .01$, so the interaction term was included in the final version of the model. Table 3 shows the results of the regression analysis, with the Experimental condition functioning as the reference category. The Hosmer-Lemeshow test of goodness-of-fit indicated that the final model provided a good overall fit for the data. The interaction between age group and condition was significant, both for the comparison between the Experimental condition and the Unintentional condition, and for the comparison between the Experimental and the Control condition. Gender and initial emotion rating were not significant predictors.

Given that the interaction term in the regression model was significant, chi-squared analyses examined whether the number of children who felt sadder versus not sadder differed as a function of condition, separately for each age group. These analyses showed that the

difference between the Experimental and the Intentional conditions was not significant for the 5- to 6-year-olds, $\chi^2 (N = 56) = 0.22, df = 1, p = .64$, but was significant for the 7- to 9-year-olds, $\chi^2 (N = 64) = 15.97, df = 1, p < .001$; similarly, the difference between the Experimental and the Control conditions was not significant for the 5- to 6-year-olds, $\chi^2 (N = 57) = 0.49, df = 1, p = .83$, but was for the older group, $\chi^2 (N = 63) = 17.28, df = 1, p < .001$. Chi-squared analyses were also used to examine whether there were effects of age on the number of children who felt sadder versus not sadder, separately for each condition. There was a significant effect of age on the number of children who felt sadder in the Experimental condition, $\chi^2 (N = 60) = 13.03; df = 2; p < .001$, but not in the other two conditions, both $ps > .44$. Thus, only the older children felt sadder more often in the Experimental condition than the other two conditions, and they were significantly more likely to feel sadder in this condition than the younger children.

In summary, unlike in Experiment 1, in this experiment we found age effects on performance in the Sticker task. The younger group in this study were 5- to 6-year-olds, whereas they were 6- to 7-year-olds in Experiment 1. Fewer than 30% of the younger children reported feeling sadder in the Experimental condition, which measured interpersonal regret. Their performance contrasted with that of the older group, with around 74% of children reporting feeling sadder in the interpersonal regret task in Experiment 2. The findings of Experiment 2 in combination of those from Experiment 1 suggest a lower limit in the age at which children feel intrapersonal regret, with 5- to 6-year-olds not reporting this emotion but this emotion being present in children a year older (the 6- to 7-year-olds in Experiment 1).

Experiment 3

Regret is typically viewed as a functional emotion that can improve decision making (Roese, 2005; Zeelenberg & Pieters, 2007), because regretting a course of action that led to a

poor outcome can lead one choosing differently when subsequently faced with similar choices. Importantly for the idea that regret is a functional emotion, O'Connor et al. (2014) demonstrated that children who experience regret in an intrapersonal regret task are more likely to make a different choice when faced with the same decision again a day later. This finding suggests that the developmental emergence of regret affects children's decision making.

It also suggests the interesting hypothesis that experiencing regret about a failure to make a prosocial choice might affect the likelihood that children subsequently act prosocially. Our final experiment directly tested that hypothesis. In Experiment 3, we examined whether children experienced regret in the interpersonal regret task after failing to donate a sticker, by getting children to complete the Experimental condition of the Sticker task used in Experiments 1 and 2. We then explored whether children who regretted failing to donate were more likely to make prosocial choices in a completely different economic choice task. We adapted the economic choice task used by Fehr, Bernhard, and Rockenbach (2008) in which children completed a number of trials that involved choosing between two possible distributions of tokens, with some tokens to be kept by children themselves and some to be given to another (unidentified) child. In this task, the options always differ in terms of how beneficial they are to the other child and of interest is whether children select the kinder option. The trials vary in terms of whether choosing the kinder option is disadvantageous to the chooser themselves or inequitable.

We tested the hypothesis that children who experienced regret on the Sticker task were subsequently more likely to make choices that benefit another child in the economic choice task. An association between experiencing regret on the Sticker task and making kinder choices could occur for two reasons. It could occur because the experience of regret itself affects children's subsequent decisions, or it could occur because of individual

differences that separately make it more likely that children experience regret and also make kinder choices in the economic choice task. To distinguish between these possibilities, children were divided into two groups, with half of the children first completing the Sticker task, followed by the economic choice task, and half completing the tasks in the reverse order. If experiencing regret results in children making kinder choices, then an association between experiencing regret and kinder choices in the economic choice task should only occur if children have completed the interpersonal regret task first.

Method

Participants. Participants were 134 6- to 7-year-olds (66 females; $M = 86$ months, Range = 73 - 96 months). Half of the group was randomly assigned to one of two task orders (Economic First or Regret First conditions). All of the participants were Caucasian except two who were of Asian ethnic origin. All children were sampled using volunteer sampling via parental consent letters from schools that served all socio-economic bands.

Materials. For the interpersonal regret task, these were identical to those used in Experiments 1 and 2. For the Economic task, six laminated pages were used. Three had an arrow pointing upwards, and each one had a different number of circular tokens depicted on it (0, 1, and 2); the other three had an arrow pointing downwards and similarly had a number of tokens depicted on it (0, 1, and 2). A generic drawing of a classroom of children was also used for this task along with some plastic tokens that could be exchanged for stickers.

Procedure. The procedure for training children to use the emotion scale was the same as in Experiments 1 and 2, and the procedure for the interpersonal regret (Sticker) task was the same as used in the Experimental condition in Experiments 1 and 2. For the economic choice task (adapted from Fehr et al., 2008), there was a training in phase in which children were initially introduced to two puppets and two pairs of laminated pages were placed between the puppets showing different distributions of rewards. Children were required to

correctly answer questions about the nature of the choice facing one of the puppets in the training phase before moving on to the main task.

Children were informed that they were going to play the game themselves, and that the pictures showed how many tokens they would win and how many “another person” from their class would win. Following Fehr et al. (2008), it was not specified who this other child was. The sets of pictured choices were placed in between the child and the drawing of children in a classroom, with arrows pointing downwards towards the child and upwards towards the drawing. Children were told that they had to choose one pair of pages (or one “side of the table”). There were three different trials in the economic choice task: Envy [choice was between (1, 1) and (1, 2); i.e., between each child receiving two tokens, or the choosing child winning one token and the other child two tokens], Prosocial [choice was between (1,1) and (1, 0)] and Sharing [choice was between (1, 1) and (2,0)]. The order in which these trials were administered was varied between children. Following completion of each trial, the appropriate number of tokens was distributed, and children were able to swap their tokens for stickers of their choice at the end of task. Children in each condition performed both the interpersonal regret task and the economic choice task, with the only difference being the order in which the tasks were completed.

Results and Discussion

Of the 134 participants, 6 chose to donate their sticker rather than keep it. All donors were removed from subsequent analysis, resulting in a final sample size of 128 children.

The mean initial emotion ratings on discovering that the other child could not win a prize was 1.99 ($SD = 1.18$). An ANOVA with a between subjects factor of Task Order (Regret First versus Economic First) found no significant effect on these initial ratings, $F < 1$. Children who subsequently reported feeling sadder on discovering that the other child could have won a prize if they had donated the necessary sticker were classified as regretters on the

interpersonal regret task (59.4% of children); those who rated themselves as feeling the same (15.6%) or happier (25%) were classified as non-regretters. Regression analysis was used to examine the number of children who were classified as regretters using the predictors of gender, age (in months), and Task Order. A model containing these three predictors did not differ significantly from the null model, $\chi^2(3) = 2.84, p > .05$, and none of the three predictors was significant, all $ps > .05$.

Choices on each trial of the Economic game were classified in terms of whether children made the choice that was most beneficial to the other child; this was the (1,1) choice in the Prosocial and Sharing trials, and in Envy trial it was the (1, 2) choice. Figure 3 shows the percentage of kinder choices as function of Task Order and whether children experienced regret. It can be seen from Figure 3 that kinder choices were highest in the Prosocial trial (in which this choice did not disadvantage the choosing child), followed by the Sharing Trial (in which this choice did disadvantage the choosing child), and were lowest in the Envy trial (in which this choice conflicted with the most egalitarian choice, but had no advantage or disadvantage for the choosing child). The highest proportion of kinder choices was in the group of regretters in the Regret First condition. Analyses showed that in this condition there was an association between experiencing regret and making the kinder choice in the Prosocial trial, $\chi^2 (N = 65) = 6.79; df = 1; p = .009$, and in the Sharing trial, $\chi^2 (N = 65) = 7.49; df = 1; p = .006$, but not in the Envy trial, $\chi^2 (N = 65) = 0.93; df = 1; p = .760$. Regretters who completed the Regret task first were more likely to make the kinder choice in the Prosocial and Sharing trials than non-regretters. However, there was no association between experiencing regret and making the prosocial choice in any of the trial types in the Economic First condition, all $\chi^2 (N = 63) < 1.7; df = 1; ps > .270$.

Children who regretted failing to donate a resource were more likely to make kinder choices in a separate task. However, this association between experiencing regret and kinder

choices in the economic game only held for that group of children who completed the interpersonal regret task first. This suggests that it was the actual experience of regret that resulted in children subsequently making a larger number of kinder choices, rather than there being individual differences that separately increased the likelihood that children felt interpersonal regret and the likelihood that children made kinder choices in the economic choice task. These findings indicate that experiencing interpersonal regret regarding a choice that has a negative impact on another person can facilitate subsequent prosocial behavior in children.

General Discussion

This study was the first to directly examine the development of interpersonal regret, and also to explore the impact of this type of regret on children's prosocial behavior. There were two key findings. First, by the time children are aged 6-7, the majority of them are capable of experiencing interpersonal regret. However, we found no evidence of this type of regret in children younger than this age. Second, experiencing this emotion has an impact on the subsequent choices that 6-7-year-olds make: children who experience interpersonal regret are more likely subsequently to make kinder choices than children who do not experience this emotion. This suggests that when interpersonal regret emerges developmentally, it may have an effect on children's prosocial behavior, just as the emergence of intrapersonal regret seems to impact on children's decision making involving self-interested choices (O'Connor et al., 2014).

The development of interpersonal regret

Why might the 5- to 6-year-olds have failed to show regret in our task? We can distinguish between at least three possible explanations that we will consider in turn. First, it may be that these younger children do feel regret but find it difficult to report on their emotions in our paradigm. Our findings suggest that this interpretation is not correct: younger

children were just as likely as older children to report feeling sad about the fact that the next child could not win a prize in their initial emotion ratings. Where they differed from the older children was in whether they subsequently felt sadder on discovering that the specific sticker that they had decided to keep was the one the other child needed. As discussed further below, we interpret this as a measure of regret, because older children's negative emotions seem specifically underpinned by the thought that they had had the opportunity to make a different choice (to donate the sticker), which would have enabled the other child to win a prize.

This brings us to a second possible interpretation of the younger children's difficulties, which is that they may have had problems either generating or using counterfactuals appropriately. Regret requires being able to consider a counterfactual alternative in which a different outcome had occurred, and evaluatively comparing that outcome to the one that actually obtained. As Beck Riggs, and Burns (2011) have argued, experiencing regret thus typically requires not just the ability to think counterfactually, but also the ability to flexibly switch between representations of the actual and counterfactual world in order to make the appropriate evaluative comparisons. On this basis, they argued that domain-general cognitive flexibility is critical in the development of regret. Some evidence for this claim comes from Burns et al.'s (2012) study, in which a measure of attentional flexibility predicted whether children experienced intrapersonal regret. Furthermore, Beck and Crilly (2009) have argued that making such evaluative comparisons requires a grasp of the nature of possibility, i.e., an understanding that the counterfactual event is one that could possibly have replaced the actual event, with such a grasp being known to develop later than the ability to pass typical counterfactual reasoning tasks (see Beck et al., 2006).

Given these claims, the difficulties that we have observed in our younger children could be general difficulties with experiencing regret that would apply both to intrapersonal

and interpersonal regret and stem from the cognitive demands of evaluatively comparing actual and counterfactual outcomes. The plausibility of this suggestion hinges on whether it can be assumed that children of this age would also not show intrapersonal regret, and, as mentioned in the introduction, there is mixed evidence regarding this issue (e.g., Amsel & Smalley, 2002, Rafetseder & Perner, 2012; Weisberg & Beck, 2012); a comparison of children's performance on our task and on an intrapersonal regret task would help establish whether younger children's difficulties are due to more generalized problems in experiencing regret.

Because it is not clear at this stage whether the differences between the younger and the older children's performances in our task can be attributed to a domain-general inability to experience regret in the younger children, it is worth also mentioning a third possibility, which is that the younger group's failure to show negative emotions stems specifically from the interpersonal character of the decision-making context. From a socio-cognitive perspective, our interpersonal regret task could be seen as making a demand not required by intrapersonal regret. In intrapersonal regret tasks, the actual and counterfactual outcomes that need to be evaluatively compared are (i) readily apparent (typically they are visually on display) and (ii) differ straightforwardly in terms of their value to the self (e.g., one candy is not as good as five candies). However, in our intrapersonal regret task, the process involves a consideration of the differential effect of each choice option on another person, which is in itself an exercise in perspective-taking, an evaluative comparison of the merits of the contrasting choices (actual and counterfactual) yielding these outcomes, and a recognition of one's personal responsibility in determining the outcome. While components of these individual socio-cognitive abilities may already be available in young children, coordinating them with counterfactual thinking might itself be demanding.

Regret and guilt

We have described our task as measuring interpersonal regret in children rather than guilt. We are aware, though, that there is disagreement in the existing literature over whether interpersonal regret should be distinguished from guilt, and if so on what basis (Berndsen et al., 2010; Breugelmans, Zeelenberg, Gilovich, Huang, & Shani, 2014; Kedia & Hilton, 2011; Roseman, Weist, & Swartz, 1994; Zeelenberg & Breugelmans, 2008). Berndsen et al. (2010, p. 67) suggest that “guilt is a more appropriate term than regret to describe feelings of emotional distress in situations of interpersonal harm. Similarly, regret seems a more appropriate emotion in situations of intrapersonal harm.” On their approach, it would seem to be more appropriate to describe the negative emotions measured here as guilt rather than as regret, and perhaps to dispense with the term “interpersonal regret” entirely.

One problem with adopting such an approach in the context of our study, though, is that it makes difficult to explain the differences we observed between the responses of the younger and the older children, since other studies indicate that even very young children can experience negative emotions after causing interpersonal harm, which may plausibly be described as guilt, and have in fact been termed thus by the researchers carrying out the relevant studies (Barrett et al., 1993; Kochanska et al., 2002). We interpret our task as measuring a different, or more specific, type of negative emotion. Furthermore, we think that drawing a distinction between interpersonal regret and guilt is also recommended by two other sets of considerations: (a) one concerning the types of thoughts, experiences, and action tendencies associated with them, and (b) one concerning the extent to which they are necessarily underpinned by counterfactual thought.

Beginning with (a), studies that have examined judgments regarding the nature of emotions occurring in interpersonal contexts indicate that it is possible to distinguish between guilt and interpersonal regret on the grounds that each of them seems to be associated with a different set of thought patterns and action tendencies (Breugelmans et al., 2014; Roseman et

al., 1994; Zeelenberg & Breugelmans, 2008). Specifically, Breugelmans et al. show that guilt is associated with the sense of having morally transgressed alongside the action tendency to apologize or seek to be forgiven, whereas interpersonal regret is associated with a sense of feeling responsible for having made a mistake and the action tendency to do things differently in the future (see also Roseman et al., 1994, for very similar findings). Indeed, in a cross-cultural study they show that, unlike in a Western sample who most frequently experience intrapersonal regret, in a Taiwanese sample regret was most frequently experienced in interpersonal contexts, while still remaining distinct from guilt along the same dimensions in both samples. This cross-cultural data provides a compelling reason for maintaining a distinction between interpersonal regret and guilt.

Turning to (b), the issue of whether guilt and regret differ in terms of the involvement of counterfactual thought has not been to the fore in research conducted with adults, perhaps because their counterfactual reasoning abilities can be assumed. By contrast, in a developmental context where mature counterfactual reasoning abilities cannot be assumed, it becomes much more pressing to consider the role of counterfactual thought, and we believe that it is useful to distinguish between negative emotions arising from interpersonal harm that do or do not require such thought. The distinction between emotions that do or do not require counterfactual thought is supported by considerable evidence from neuropsychological studies that have focused on intrapersonal rather than interpersonal regret. Such studies indicate that there are distinctive brain processes involved in counterfactual evaluation that underpin the experience of intrapersonal regret following choices with consequences that are sub-optimal for the self (e.g., Chua, Gonzalez, Taylor, Welsh, & Liberzon, 2009; Giorgetta et al., 2013; Sommer, Peters, Gläscher & Büchel, 2009). Our suggestion is that a similar distinction between negative emotions that do or do not require counterfactual thought can be made in the case of choices with consequences that are sub-optimal or harmful for another

person. Thus, we suggest reserving the term interpersonal regret for the emotion that requires such counterfactual thought, in line with the long-standing psychological definition of regret as a counterfactual emotion (Gilovich & Medvec, 1995; Landman, 1993) that has been supported by the more recent neuropsychological evidence.

Taken together, these considerations suggest that in interpreting our task as measuring regret rather than guilt, two parallel issues need to be considered: (a) whether children's negative emotions in our task are likely to have the characteristics that previous studies have found to be associated with guilt or those associated with regret (Breugelmans et al., 2014; Roseman et al., 1994) and (b) whether these emotions involve counterfactual thought.

With regard to (b), our control and non-intentional conditions rule out the possibility that children's negative emotions are underpinned by a simple thought that only has a present-tense content such as "I have the sticker that the other child needs". The contrast between the findings in the Experimental condition and the other two conditions means that children's negative emotions that we are interpreting as regret must be underpinned by thoughts about (i) their own past choice (which was instrumental in the Experimental but not Unintentional condition) and (ii) the consequences of this choice for the other child (which differed between the Experimental and Control conditions). What is at issue is whether (ii) required a consideration not just of the fact that the other child cannot win a prize because they kept the sticker but also of the counterfactual thought that if they had donated the sticker, the other child would have been able to win. In previous studies that attempt to elicit guilt in toddlers (Barrett et al., 1993; Kochanska et al., 2002), children's negative emotions are likely to straightforwardly reflect the undesirable and immediately apparent consequences of their actions (e.g., the broken toy in the mishap paradigm). That is, it does not seem parsimonious to assume that children must also be entertaining the thought that if they had not carried out an action, the harm would have been avoided (i.e., the toy would still be

intact). Indeed the majority of developmental psychologists would assume that such counterfactual thoughts are beyond the cognitive capabilities of very young children

In our task, by contrast, negative consequences arise not because children acted in a harmful way *per se* (indeed, in the Control condition their action did not cause harm) but as a knock-on effect of their failure to donate, given the nature of the circumstances. Unlike in the guilt-eliciting paradigms, in our task children are in a situation of missed opportunity: they had the opportunity to act in such a way that would have subsequently prevented a negative outcome for another child (although they did not know this at the time of acting), but they did not take up this opportunity. We believe it is most plausible to interpret negative emotions in our task in this way: as a recognition that, under the circumstances, the failure to act prosocially meant that the child had missed an opportunity to help. Negative emotions following missed opportunities are underpinned by counterfactual content, and indeed have been characterized as the prototypical example of regret (Beike, Markman, & Karadogan, 2009). Notably, an advantage of this interpretation is that it also provides a coherent way of explaining the age patterns that we report, assuming developmental changes in counterfactual reasoning skills. However, although we believe it is highly plausible to assume that children's negative emotions are underpinned by this counterfactual thought, future research should explore more directly the role of counterfactual thought in children's responses in our task. One way to do this would be to ask children to generate explanations for their emotion responses; research by O'Connor et al. (2012) suggests that it is possible to code such responses for their counterfactual content.

We now turn to issue (a): whether the associated thoughts/experiences and action tendencies are likely to be those aligned with regret rather than guilt. As we already mentioned, previous studies suggest that guilt but not interpersonal regret is associated with experiencing a distinctive sense of having morally transgressed and an action tendency to

seek forgiveness or apologize, whereas regret is associated with a feeling of responsibility and the action tendency to do things differently. The findings of our studies indicate that the negative emotion children experience is highly likely to be associated with a feeling of responsibility (it is observable only in the Experimental condition in which children are in fact responsible). Furthermore, we provide compelling evidence in Experiment 3, which we discuss in the next section, that children's experiencing of this emotion is associated with the action tendency to behave differently. In both these respects, then, this emotion appears to have the characteristics of regret. We did not assess whether children had the action tendency to seek forgiveness or a sense of having made a distinctively moral transgression. However, we note that while children missed an opportunity to help another child, it is not clear in the paradigm that their action was obviously immoral. At the time of making their choice, children had no good reason to believe that keeping the sticker would result in harm to the next child (this was deliberately left ambiguous), and children might justifiably have assumed that the experimenter would provide enough stickers for every child to complete the task. Thus, this may be a situation in which regret is appropriate (because an opportunity to help was missed) but guilt is not necessarily appropriate (because children did not intend to actually harm another person).

Interpersonal regret and prosocial choice

The findings of Experiment 3 indicated that experiencing interpersonal regret about failing to act prosocially led to children subsequently making fairer or more prosocial choices. This finding demonstrates that the emotion we have measured has a meaningful effect on children's behavior. According to functional theories of regret, although it is unpleasant to experience regret, this emotion is an adaptive one in that it supports better decision making (Roese, 2005; Zeelenberg, 1999; Zeelenberg & Pieters, 2007; we note though that there is another tradition in psychology that emphasizes the detrimental effects of

harboring regrets on well-being, particularly in old age, e.g., Brassen, Gamer, Peters, Gluth, & Büchel, 2012; Wrosch, Bauer, & Sheier, 2005). Most of the research that has examined the links between regret and decision making has focused on intrapersonal regret (e.g., Connolly & Zeelenberg, 2002; Coricelli et al., 2005; Zeelenberg, 1999). On the basis of such findings, Zeelenberg and Pieters (2007) argue that regret affects decision making in two ways: as a result of experiencing the emotion of regret itself and as a result of anticipating future regret. They argue that the function of experienced regret following a non-optimal choice is to enable people to switch choices when faced with a similar decision again. Anticipation of regret affects decision making because people are regret averse and will try to make choices that will minimize future regret, even if they have never encountered that type of choice before. There is strong evidence from studies with adults, reviewed by Zeelenberg and Pieters, that intrapersonal regret affects self-interested decision making in both these ways. What is less clear is whether interpersonal regret has similar effects on choices that involve another person.

Some studies have examined the role of regret in tasks in which interpersonal choices are made, most notably the ultimatum game (Martinez, Zeelenberg, & Rijsman, 2011, van der Schalk, Bruder, & Manstead, 2012; van der Schalk et al., 2015; Zeelenberg & Beattie, 1997). There is some evidence that players in this game will be more likely to make fairer offers if they anticipate feeling interpersonal regret about making an unfair offer (van der Schalk et al., 2012; van der Schalk et al., 2015), although there is also evidence that players anticipate intrapersonal regret over making unduly high offers and that this leads to lower offers (Zeelenberg & Beattie, 1997). Taken together, this set of findings with adults suggests that anticipating interpersonal regret can lead to more prosocial decisions, but that this may be weighed against anticipated intrapersonal regret about being unnecessarily generous.

Our findings in Experiment 3 indicate that experiencing interpersonal regret in one task results in children being more likely to make a generous or fair choice in a different task. This finding is consistent with functional theories of regret, and also suggests that the developmental emergence of interpersonal regret may have an impact on children's prosocial decision making. However, although we can be confident that interpersonal regret in the Sticker task resulted in children subsequently being more likely to make fairer or prosocial choices, the mechanism underpinning this effect needs to be addressed in future research. In particular, it is not clear whether it is the experience of regret itself that directly affected subsequent behavior, or whether experiencing regret facilitated the anticipation of future regret which in turn affected children's choices in the economic game. This issue is important in the context of the wider debate over how emotions impact on decision making (e.g., Baumeister, Vohs, DeWall, & Zhang, 2007; Winkielman, Knutson, Paulus, & Trujillo, 2007).

Summary and conclusions

Our studies suggest that children can experience interpersonal regret following a failure to act prosocially from the age of 6- to 7 years, an age which is consistent with the majority of findings in the developmental literature on intrapersonal regret. Experiencing this emotion has an effect on children's behavior: children who felt regret were more likely to subsequently make prosocial choices in a separate task. We did not find evidence of interpersonal regret in children younger than 6-7 years. Although this study provides novel developmental findings regarding interpersonal regret, it also highlights the need for future research that would establish the nature of the relevant developmental changes and shed more light on exactly how regret could have an impact on children's behavioral choices and, more broadly, on their moral and social development.

References

Amsel, E., & Smalley, D. (2000). Beyond really and truly: Children's counterfactual thinking about pretend and possible worlds. In K. Riggs & P. Mitchell (Eds.), *Children's reasoning and the mind* (pp. 99–134). Brighton, UK: Psychology Press.

Arsenio, W. F., & Kramer, R. (1992). Victimizers and their victims: Children's conceptions of the mixed emotional consequences of moral transgressions. *Child Development*, 63(4), 915-927. doi: 10.1111/j.1467-8624.1992.tb01671.x

Arsenio, W. F., & Lover, A. (1995). Children's conceptions of sociomoral affect: Happy victimizers, mixed emotions and other expectancies. In M. Killen & D. Hart (Eds.), *Morality in everyday life: Developmental perspectives* (pp. 87-128). Cambridge: Cambridge University Press.

Baker, E. C., Baibazarova, E., Ktistaki, G., Shelton, K. H., & Van Goozen, S. H. M. (2012). Development of fear and guilt in young children: Stability over time and relations with psychopathology. *Development and Psychopathology*, 24(3), 833-845. doi: <http://dx.doi.org/10.1017/S0954579412000399>

Barrett, K. C., Zahn-Waxler, C., & Cole, P. M. (1993). Avoiders versus amenders - Implications for the investigation of guilt and shame during toddlerhood? *Cognition & Emotion*, 7(6), 481-505. doi: 10.1080/02699939308409201

Baumeister, R. F., Vohs, K. D., DeWall, C. N., & Zhang, L. (2007). How emotion shapes behavior: Feedback, anticipation, and reflection, rather than direct causation. *Personality and Social Psychology Review*, 11(2), 167-203. doi: 10.1177/1088868307301033

Beck, S. R., & Crilly, M. (2009). Is understanding regret dependent on developments in counterfactual thinking? *British Journal of Developmental Psychology*, 27, 505-510. doi:10.1348/026151008x401697

Beck, S. R., Robinson, E. J., Carroll, D. J., & Apperly, I. A. (2006). Children's thinking about counterfactuals and future hypotheticals as possibilities. *Child Development*, 77(2), 413-426. doi: 10.1111/j.1467-8624.2006.00879.x

Beck, S. R., Riggs, K. J., & Burns, P. (2011). Multiple developments in counterfactual thinking. In C. Hoerl, T. McCormack, & S.R. Beck (Eds.) *Understanding counterfactuals, understanding causation* (pp. 110-122). Oxford: Oxford University Press.

Beike, D. R., Markman, K. D., & Karadogan, F. (2009). What we regret most are lost opportunities: A theory of regret intensity. *Personality and Social Psychology Bulletin*, 35, 385-397. doi: 10.1177/0146167208328329

Berndsen, M., van der Pligt, J., Doosje, B., & Manstead, A. (2004). Guilt and regret: The determining role of interpersonal and intrapersonal harm. *Cognition and Emotion*, 18(1), 55-70. doi:10.1080/02699930244000435

Brassen, S., Gamer, M., Peters, J., Gluth, S., & Buchel, C. (2012). Don't look back in anger! Responsiveness to missed chances in successful and unsuccessful Aging. *Science*, 336(6081), 612-614. doi:10.1126/science.1217516

Breugelmans, S. M., Zeelenberg, M., Gilovich, T., Huang, W. H., & Shani, Y. (2014). Generality and cultural variation in the experience of regret. *Emotion*, 14(6), 1037-1048. doi:10.1037/a0038221

Burns, P., Riggs, K. J., & Beck, S. R. (2012). Executive control and the experience of regret. *Journal of Experimental Child Psychology*, 111(3), 501-515. doi:10.1016/j.jecp.2011.10.003

Bybee, J. (1998). *Guilt and children*. San Diego, CA: Academic Press.

Chua, H. F., Gonzalez, R., Taylor, S. F., Welsh, R. C., & Liberzon, I. (2009). Decision-related loss: regret and disappointment. *Neuroimage*, 47, 2031-2040. doi.org/10.1016/j.neuroimage.2009.06.006

Connolly, T., & Zeelenberg, M. (2002). Regret in decision making. *Current directions in Psychological Science*, 11(6), 212–216. doi: 10.1111/1467-8721.00203

Coricelli, G., Critchley, H. D., Joffily, M., O'Doherty, J. P., Sirigu, A., & Dolan, R. J. (2005). Regret and its avoidance: A neuroimaging study of choice behavior. *Nature Neuroscience*, 8(9), 1255–1262. doi:10.1038/nn1514

Fehr, E., Bernhard, H., & Rockenbach, B. (2008). Egalitarianism in young children. *Nature* 454(28), 1079–1084. doi:10.1038/nature07155

Ferguson, T. J., & Stegge, H. (1998). Measuring guilt in children: a rose by any other name still has thorns. In J. Bybee (Eds), *Guilt and Children* (pp. 19–74). San Diego: Academic Press.

Ferguson, T. J., Stegge, H., Miller, E. R., & Olsen, M. E. (1999). Guilt, shame, and symptoms in children. *Developmental Psychology*, 35(2), 347–57.
<http://dx.doi.org/10.1037/0012-1649.35.2.347>

Giorgetta, C., Grecucci, A., Bonini, N., Coricelli, G., Demarchi, G., Braun, C., & Sanfey, A. G. (2013). Waves of regret: a MEG study of emotion and decision-making. *Neuropsychologia*, 51, 38-51. doi.org/10.1016/j.neuropsychologia.2012.10.015

Guttentag, R., & Ferrell, J. (2008). Children's understanding of anticipatory regret and disappointment. *Cognition and Emotion*, 22(5), 815–832.
doi:10.1080/02699930701541542

Harris, P. L., German, T. P., & Mills, P. E. (1996). Children's use of counterfactual thinking in causal reasoning. *Cognition*, 61(3), 233-259. doi:10.1016/S0010-0277(96)00715-9

Ioannou, S., Ebisch, S., Aureli, T., Bafunno, D., Ioannides, H. A., Cardone, D., Manini, B., Romani, G. L., Gallese, V., & Merla, A. (2013) The autonomic signature of

guilt in children: A thermal infrared imaging study. *PLoS ONE*, 8(11), 1-11.

<http://dx.doi.org/10.1371/journal.pone.0079440>

Kedia, G., & Hilton, D. J. (2011). Hot as hell! The self-conscious nature of action regrets. *Journal of Experimental Social Psychology*, 47(2), 490-493.

doi:10.1016/j.jesp.2010.10.017

Keller, M., Lourenço, O., Malti, T., & Saalbach, H. (2003) The multifaceted phenomenon of happy victimizers: A cross-cultural comparison. *British Journal of Developmental Psychology*, 21(1), 1-18. doi: 10.1348/026151003321164582

Kim, Sanghag, K., Kochanska, G, Boldt, L. J., Nordling, J. K., & O'Bleness, J. J. (2014). Developmental trajectory from early responses to transgressions to future antisocial behavior: Evidence for the role of the parent-child relationship from two longitudinal studies. *Development and Psychopathology*, 26(1), 93-109.

<http://dx.doi.org/10.1017/S0954579413000850>

Kochanska, G., Gross, J. N., Lin, M. H., & Nichols, K. E. (2002). Guilt in young children: development, determinants, and relations with a broader system of standards. *Child Development*, 73(2), 461-482. doi: 10.1111/1467-8624.00418

Malti, T. (2016). Toward an integrated clinical-developmental model of guilt. *Developmental Review*, 39, 16-36. doi:10.1016/j.dr.2015.11.001

Malti, T., & Dys, S. P. (2015). A developmental perspective on moral emotions. *Topoi*, 34(2), 453-459. doi: 10.1007/s11245-013-9224-5

Malti, T., Gummerum, M., Keller, M., & Buchmann, M. (2009). Children's moral motivation, sympathy, and prosocial behavior. *Child Development*, 80(2), 442-460. doi: 10.1007/s11245-013-9224-5

Mandel, D. R. (2003). Counterfactuals, emotions and context. *Cognition and Emotion*, 17(1), 139-159. doi:10.1080/02699930302275

Mandel, D. R., & Dhami, M. K. (2005). "What I did" versus "What I might have done": Effect of factual and counterfactual thinking on blame, guilt, and shame in prisoners. *Journal of Experimental Social Psychology*, 41(6), 637-645.

doi:10.1016/j.jesp.2004.08.009

Martinez, L. M. F., Zeelenberg, M., & Rijsman, J. B. (2011). Behavioural consequences of regret and disappointment in social bargaining games. *Cognition and Emotion*, 25 (2), 351-359. doi:10.1080/02699931.2010.485889

McCormack, T., & Feeney, A. (2015). The development of the experience and anticipation of regret. *Cognition and Emotion*, 29(2), 266-280. doi: 10.1080/02699931.2014.912201

Miller, D. T., & Turnbull, W. (1990). The counterfactual fallacy: Confusing what might have been with what ought to have been. *Social Justice Research*, 4(1), 1-19. doi: 10.1007/BF01048532

Niedenthal, P. M., Tangney, J. P., & Gavanski, I. (1994). "If only I weren't" versus "If only I hadn't": Distinguishing shame and guilt in counterfactual thinking. *Journal of Personality and Social Psychology*, 67(4), 585-595. <http://dx.doi.org/10.1037/0022-3514.67.4.585>

Nunner-Winkler, G., & Sodian, B. (1988). Children's understanding of moral emotions. *Child Development*, 59(5), 1323–1338. doi: 10.2307/1130495

O'Connor, E., McCormack, T., & Feeney, A. (2012). The development of regret. *Journal of Experimental Child Psychology*, 111(1), 120–127. doi:10.1016/j.jecp.2011.07.002

O'Connor, E., McCormack, T., & Feeney, A. (2014) Do children who experience regret make better decisions? A developmental study of the behavioral consequences of regret. *Child Development*, 85(5), 1995–2010. doi 10.1111/cdev.12253

O'Connor, E., McCormack, T., Beck, S., & Feeney, A. (2015). Regret and adaptive decision making in young children. *Journal of Experimental Child Psychology*, 135, 86–92. doi:10.1016/j.jecp.2015.03.003

Ongley, S.F., & Malti, T. (2014). The role of moral emotions in the development of children's sharing behavior. *Developmental Psychology*, 50(4), 1148-1159. <http://dx.doi.org/10.1037/a0035191>

Proeve, M., & Tudor, S. (2010). *Remorse: Psychological and jurisprudential perspectives*. Farnham: Ashgate Publishing.

Rafetseder E., Schwitalla, M., & Perner, J. (2013). Counterfactual reasoning: from childhood to adulthood. *Journal of Experimental Child Psychology*, 114(3), 389-404. doi:10.1016/j.jecp.2012.10.010

Rafetseder, E., & Perner, J. (2012). When the alternative would have been better: Counterfactual reasoning and the emergence of regret. *Cognition and Emotion*, 26(5), 800–819. doi:10.1080/02699931.2011.619744

Roese, N. J. (1994). The functional basis of counterfactual thinking. *Journal of Personality and Social Psychology*, 66(5), 805-818. <http://dx.doi.org/10.1037/0022-3514.66.5.805>

Roese, N. J. (2005). *If only*. New York: Broadway Books.

Roese, N. J. & Olson, J. M. (1995). *What might have been: The social psychology of counterfactual thinking*. New Jersey: Erlbaum.

Roseman, I. J., Wiest, C., & Swartz, T. S. (1994). Phenomenology, behaviors, and goals differentiate discrete emotions. *Journal of Personality and Social Psychology*, 67(2), 206-221. doi:10.1037//0022-3514.67.2.206

Sommer, T., Peters, J., Gläscher, J., & Büchel, C. (2009). Structure–function relationships in the processing of regret in the orbitofrontal cortex. *Brain Structure and Function*, 213, 535-551. doi.org/10.1007/s00429-009-0222-8

Tangney, J. P., Wagner, P. E., Hill-Barlow, D., Marschall, D. E., & Gramzow, R. (1996). Relation of shame and guilt to constructive versus destructive responses to anger across the lifespan. *Journal of Personality and Social Psychology*, 70(4), 797-809. <http://dx.doi.org/10.1037/0022-3514.70.4.797>

Van der Schalk, J., Bruder, M., & Manstead, A. S. R. (2012). Regulating emotion in the context of interpersonal decisions: the role of anticipated pride and regret. *Frontiers in Psychology*. <http://dx.doi.org/10.3389/fpsyg.2012.00513>

Van Der Schalk, J., Kuppens, T., Bruder, M., & Manstead, A. S. R. (2015). The social power of regret: The effect of social appraisal and anticipated emotions on fair and unfair allocations in resource dilemmas. *Journal of Experimental Psychology: General*, 144(1), 151-157. <http://dx.doi.org/10.1037/xge0000036>

van Dijk, E., & Zeelenberg, M. (2005). On the psychology of ‘if only’: Regret and the comparison between factual and counterfactual outcomes. *Organizational Behavior and Human Decision Processes*, 97(2), 152-160. [doi:10.1016/j.obhdp.2005.04.001](https://doi.org/10.1016/j.obhdp.2005.04.001)

Van Duijvenvoorde, A. C. K., Huizenga, H. M., & Jansen, B. R. J. (2014). What is and what could have been: Experiencing regret and relief across childhood. *Cognition and Emotion* 28(5), 926-935. [doi: 10.1080/02699931.2013.861800](https://doi.org/10.1080/02699931.2013.861800)

Weisberg, D. P., & Beck, S. R. (2010). Children’s thinking about their own and others’ regret and relief. *Journal of Experimental Child Psychology*, 106(2-3), 184–191. [doi:10.1016/j.jecp.2010.02.005](https://doi.org/10.1016/j.jecp.2010.02.005)

Weisberg, D. P., & Beck, S. R. (2012). The development of children’s regret and relief. *Cognition and Emotion*, 26(5), 820-835. [doi: 10.1080/02699931.2011.621933](https://doi.org/10.1080/02699931.2011.621933)

Winkielman, P., Knutson, B., Paulus, M. P., & Trujillo, J.T. (2007). Affective influence on decisions: Moving towards the core mechanisms. *Review of General Psychology*, 11, 179-192. <http://dx.doi.org/10.1037/1089-2680.11.2.179>

Wrosch, C., Bauer, I., & Scheier, M. F. (2005). Regret and quality of life across the adult life span: The influence of disengagement and available future goals. *Psychology and Aging*, 20(4), 657-670. doi:10.1037/0882-7974.20.4.657

Zeelenberg, M., van Dijk, W. W., & Manstead, A. S. R. (1998). Reconsidering the relation between regret and responsibility. *Organizational Behavior and Human Decision Processes*, 74(3), 254-272. doi:10.1006/obhd.1998.2784

Zeelenberg, M. (1999). Anticipated regret, expected feedback and behavioral decision making. *Journal of Behavioral Decision Making*, 12(2), 93-106.

Zeelenberg, M., & Beattie, J. (1997). Consequences of regret aversion 2: Additional evidence for effects of feedback on decision making. *Organizational Behavior and Human Decision Processes*, 72(1), 63-78. doi:10.1006/obhd.1997.2730

Zeelenberg, M., & Breugelmans, S. M. (2008). The role of interpersonal harm in distinguishing regret from guilt. *Emotion*, 8(5), 589-596. <http://dx.doi.org/10.1037/a0012894>

Zeelenberg, M., & Pieters, R. (2007). A theory of regret regulation 1.0. *Journal of Consumer Psychology*, 17(1), 3-18. doi:10.1207/s15327663jcp1701_3

Table 1.

The percentage of children who felt sadder in Experiments 1 and 2 as a function of age group and condition

		Condition		
		Experimental	Control	Unintentional
Exp. 1	6- to 7-year-olds ($N = 88$)	59.3%	29.1%	27.6%
	7- to 9-year-olds ($N = 92$)	66.7%	25%	29%
Exp. 2	5- to 6-year-olds ($N = 84$)	27.6%	25%	33.3%
	7- to 9-year-olds ($N = 96$)	74.2%	21.9%	24.2%

Table 2.

Results of the Binary Logistic Regression Analyses for Experiments 1 and 2.

	B(SE)	Exp b	95% Confidence Intervals for Exp b	
			Lower	Upper
Experiment 1				
Gender	-0.15 (0.34)	0.861	0.45	1.66
Age Group	0.26 (0.34)	1.297	0.67	2.51
Unintentional	-1.50** (0.40)	0.223	0.10	0.49
Control	-1.69** (0.41)	0.185	0.08	0.41
Initial Emotion Rating	0.27 (0.16)	1.307	0.96	1.77
Constant	-1.240 (0.83)	0.289		
Experiment 2				
Gender	-0.61 (0.35)	0.55	0.28	1.08
Age Group	-0.46 (0.34)	0.63	0.32	1.24
Unintentional	-2.82* (1.32)	0.06	0.01	0.79
Control	-2.13 (1.36)	0.13	0.01	1.71
Age Group*Condition	2.54** (0.83)	12.65	2.47	64.65
Unintentional				
Age Group *Condition	2.28** (0.86)	9.75	1.82	52.26
Control				
Initial Emotion Rating	0.002 (0.16)	1.00	0.74	1.37
Constant	2.29 (0.85)	9.89		

Note. * $p < .05$; ** $p < .001$. The Experimental condition is the reference category. For Experiment 1, $R^2 = .14$ (Cox & Snell), $R^2 = .19$ (Nagelkerke); Model $\chi^2 = 27.77$; $df = 5$; $p < .001$. For Experiment 2, $R^2 = .15$ (Cox & Snell), $R^2 = .21$ (Nagelkerke); Model $\chi^2 = 29.29$; $df = 7$; $p < .001$.

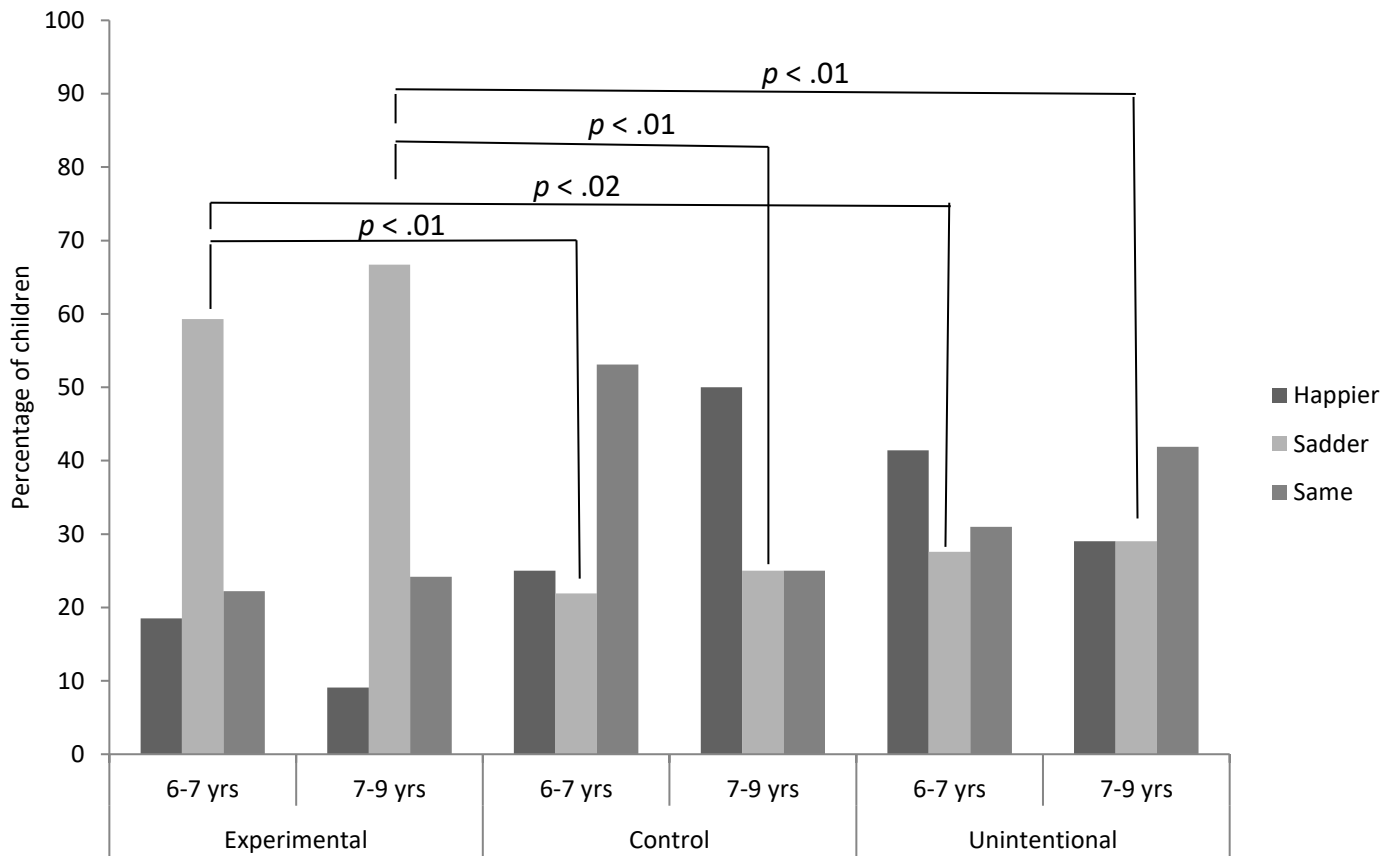


Figure 1. *Percentage of children feeling happier, sadder, or the same in Experiment 1, as a function of age group and condition.*

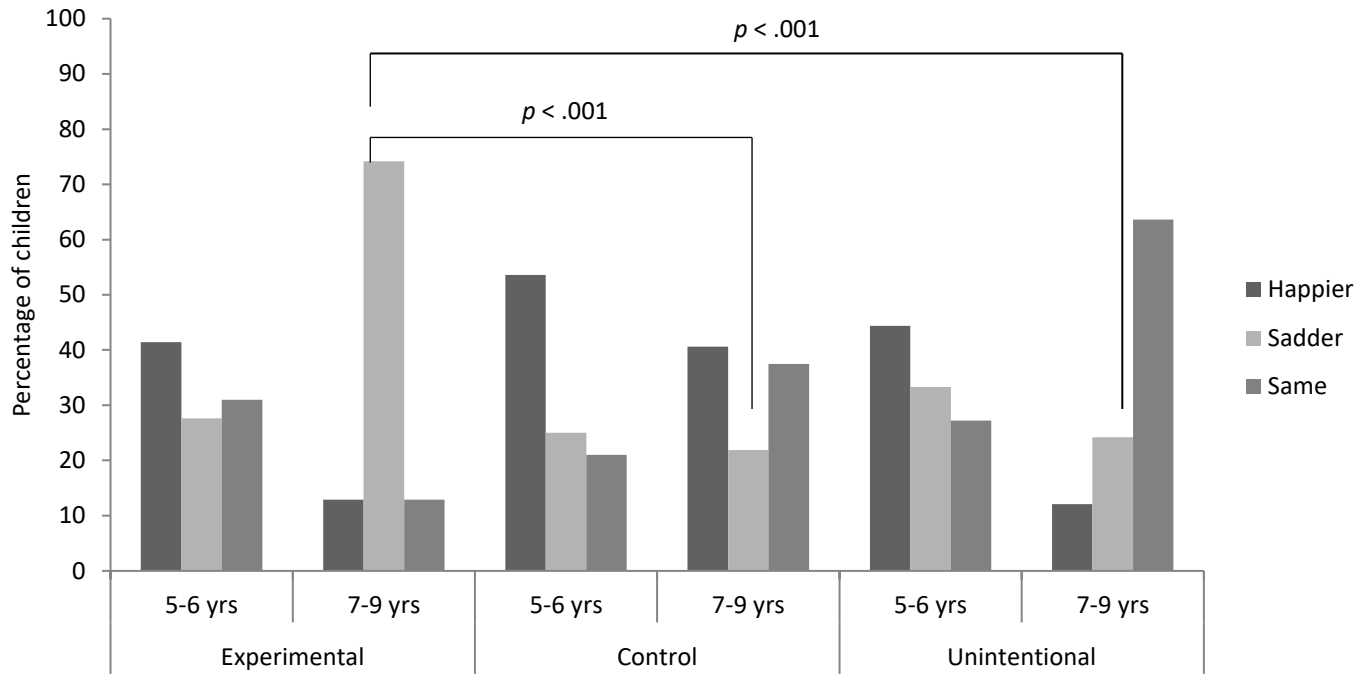


Figure 2. *Percentage of children feeling happier, sadder, or the same in Experiment 2, as a function of age group and condition.*

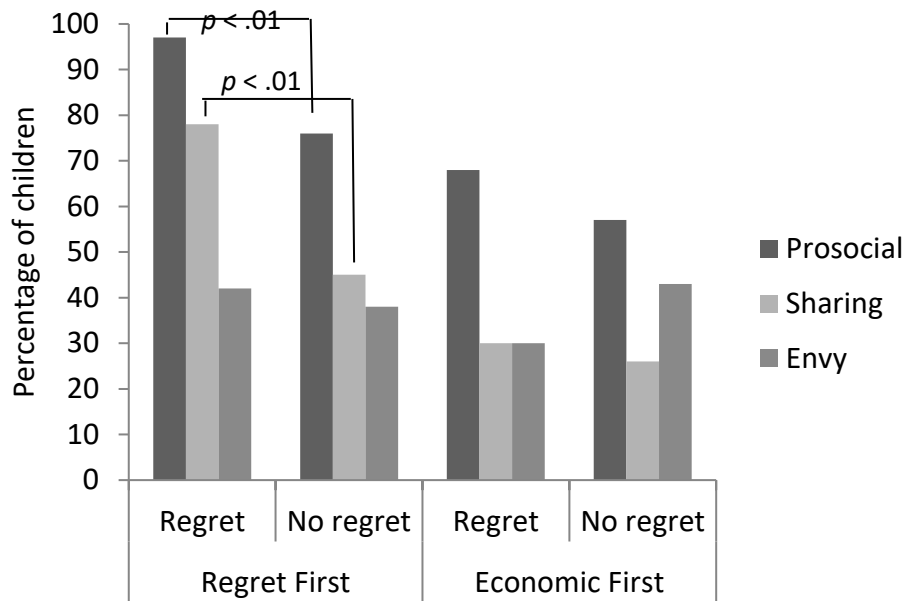


Figure 3. *Percentage of children making the most prosocial choice in each trial type in Experiment 3 as a function of task order and whether children experienced regret in the Sticker task.*